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KATHRYN A MARRA
General Motors Corporation
Legal Staff, Mail Code 482-C23-B21
P.O. Box 300
Detroit, MI 48265-3000

EXAMINER	
MERKLING, MATTHEW J	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/763,951	JOHNSON ET AL.	
	Examiner	Art Unit	
	MATTHEW J. MERKLING	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 March 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-21 and 24-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9-21 and 24-34* is/are rejected.

7)☒ Claim(s) *1* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 1 is objected to because of the following informalities: In line 7 of claim 1, there appears to be a typographical error regarding the size of the nanoparticles. The claim reads "15 m to about 25 nm". However, it appears the intended size range is "15 nm to about 25 nm" and will be examined as such. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3, 4, 5 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller (US 3,615,256) in view of Zhou (US 6,500,969) as evidenced by Kinkade (US 4,994,498).

Regarding claim 1, Miller discloses a fluidized-bed reactor (Fig. 1) comprising:

a chamber (24) defining a hollow interior region and having a lower surface (10);

a first input (12) for introducing a gas into the hollow interior region;

a plurality of catalyst particles (see catalyst bed in Fig. 1) within the hollow interior region and located on the lower surface (10), and

a fluidizing input (16) for introducing a fluidizing material into the hollow interior region (fluidizing gas), said fluidizing input having an outlet directed at the lower surface (see Fig. 1 where Miller discloses the fluidizing gas inlet is directed at the surface 10) of the chamber such that the fluidizing material fluidizes at least a portion of the plurality of catalyst particles located at the lower surface of the chamber, and

the fluidized catalyst nanoparticles react with the gas (see abstract).

While Miller teaches a catalyst for reacting with a reactant stream, Miller fails to teach the plurality of catalysts as being nanoparticles.

Zhou also discloses a catalytic process.

Zhou teaches nanoparticles comprising a metal (col. 8 lines 33-43) being utilized as the catalyst in an oxidation reaction in order to ensure high activity and selectivity of desired products (col. 5 lines 34-43). In other words, using catalyst nanoparticles to improve reaction activity was well known in the art at the time of the invention.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the nanoparticles of Zhou in the fluidized bed reactor of Becker in order to ensure high activity and selectivity of the desired reaction products.

Modified Miller teaches nano-sized oxidation catalyst in the range of 0.5 to 100nm (see Zhou, claim 15), but is silent on particle sizes in the range of 15-25nm.

However, regarding the size of the particles, it was well known in the art at the time of the invention that the particle size of the catalyst in a fluidized bed is a variable that is routinely varied to achieve the desired performance (see

Kinkade, col. 7 lines 51-59). As such the size of the catalyst particles is not considered to confer patentability to the claim. The size of the particles would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed size of the catalyst particles cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the size of the catalyst particles in modified Miller to obtain the desired fluidized bed performance (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

Regarding limitations recited in claim 1 which are directed to a manner of operating disclosed system, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114 and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim.

Regarding claim 3, Miller further discloses a port (36) for the exit of the decontaminated gas out of the hollow interior region (see Fig. 1)

Regarding claim 4, Miller further discloses a second input (50) for introducing a backpressure pulse (blowback gas) of gaseous material into the hollow interior region through the port.

Regarding claim 5, Miller further discloses a gas permeable separation device (44) in communication with both the port (36) and the second input (50), wherein the exit of gas from the hollow interior region (via conduit 56) through the gas permeable separation device (44) causes catalyst particles to collect upon the gas permeable separation device (filter) and the entrance of the backpressure pulse into the hollow interior region displaces collected catalyst particles (col. 1 lines 45-49) and allows said collected catalyst particles to join the fluidized catalyst particles (via conduit 26) and continue reacting with gas within the hollow interior region.

Regarding claim 21, Miller discloses a method processing a contaminated gas stream comprising:

providing a fluidized-bed reactor (Fig. 1, col. 1 lines 8-23) comprising:

a chamber (24) defining a hollow interior region and having a lower surface (10);

a first input (12) for introducing a gas into the hollow interior region, the contaminated gas comprising at least one hydrocarbon (col. 1 lines 8-10);

a plurality of catalyst particles within the hollow interior region (see catalyst bed in Fig. 1) and located on the lower surface (10);

a fluidizing input (16) for introducing a fluidizing material into the hollow interior region, said fluidizing input having an outlet directed at the lower surface

of the chamber (see Fig. 1 where Miller discloses the fluidizing gas inlet is directed at the surface 10),

wherein the introduction of the fluidizing material directed at the lower surface fluidizes at least a portion of the catalyst particles located on the lower surface to create a gaseous dispersion of catalyst particles (fluidized bed, see Fig. 1) that reacts with the gas to produce a product/decontaminated gas;

a port (36) for the exit of the product/decontaminated gas out of the hollow interior region;

a second input (50) for introducing a backpressure pulse (blowback gas) of gaseous material into the hollow interior region through the port; and

a gas permeable separation device (44) in communication with both the port and the second input (see Fig. 1),

introducing the gas into the hollow interior region (via conduit 12);

introducing the fluidizing material into the chamber (via conduit 16) and directing the fluidizing material at the lower surface to fluidize at least a portion of the catalyst particles (fluidized bed) located on the surface to create a gaseous dispersion of catalyst particles that react with the gas to produce a product/decontaminated gas;

passing the product/decontaminated gas from the hollow interior region (24) through the port and the separation device so that particles are collected on the separation device (catalyst particles are filtered from the exit stream via filters 44); and

introducing a backpressure pulse (via conduit 50) into the hollow interior region through the port and separation device so as to displace catalyst particles from the separation device ; and

allowing the plurality of catalyst particles displaced from the gas separation device to join the fluidized dispersion of catalyst particles (via conduit 26) and continue reacting with the contaminated gas within the hollow interior region.

While Miller teaches a catalyst for reacting with a reactant stream, Miller fails to teach the plurality of catalysts as being nanoparticles.

Zhou also discloses a catalytic process.

Zhou teaches nanoparticles comprising a metal (col. 8 lines 33-43) being utilized as the catalyst in an oxidation reaction in order to ensure high activity and selectivity of desired products (col. 5 lines 34-43). In other words, using catalyst nanoparticles to improve reaction activity was well known in the art at the time of the invention.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the nanoparticles of Zhou in the fluidized bed reactor of Becker in order to ensure high activity and selectivity of the desired reaction products.

Modified Miller teaches nano-sized oxidation catalyst in the range of 0.5 to 100nm (see Zhou, claim 15), but is silent on particle sizes in the range of 15-25nm.

However, regarding the size of the particles, it was well known in the art at the time of the invention that the particle size of the catalyst in a fluidized bed is a variable that is routinely varied to achieve the desired performance (see Kinkade, col. 7 lines 51-59). As such the size of the catalyst particles is not

considered to confer patentability to the claim. The size of the particles would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed size of the catalyst particles cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the size of the catalyst particles in modified Miller to obtain the desired fluidized bed performance (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

4. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miller (US 3,615,256) and Zhou (US 6,500,969) as applied to claim 21 above, and further in view of Ballantine et al. (US 2006/0078771).

Regarding claim 24, modified Miller, as discussed in claim 21 above, discloses a vessel with multiple inlets (process inlet and fluidizing inlet, along with a backpressure backflow inlet). Modified Miller, however, does not disclose a specific control strategy utilized by a control device that synchronizes the backpressure pulse valve with the first input valve.

Ballantine discloses a series of controlled valves introducing multiple fluid inlets to the same process space.

Ballantine teaches a valve synchronization process of closing an inlet valve (402) connected to a vessel (412) when a second inlet valve (401) is opened in order to prevent backflow through the first process valve (paragraph 42)

It would have been obvious to one of ordinary skill in the art at the time of the invention to change the control scheme of the valve controller in modified Miller to synchronize the valve opening of the second inlet with the valve opening of the first inlet such that when the second inlet valve opens, the first inlet valve closes in order to prevent back flow through the first inlet valve, as is taught by Ballantine.

5. Claims 25, 27, 30 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miller (US 3,615,256) in view of Zhou (US 6,500,969) and Ballantine et al. (US 2006/0078771).

Regarding claim 25, Miller discloses a fluidized bed reactor system (Fig. 1) comprising:

a fluidized-bed reactor having a chamber (24), a plurality of catalyst particles (catalyst bed, see Fig. 1), a first input (12), a fluidizing input (16), a port (56), a second input (50) and a gas permeable separation device (44), the chamber defining a hollow interior region with the plurality of catalyst particles disposed therein (see Fig. 1), and the first input (12), the fluidizing input (16), and the port (36) being in communication with the hollow interior region (see Fig. 1), the first input (12) configured to direct a gas into the hollow interior region (see Fig. 1), the fluidizing input (16) configured to direct a fluidizing material toward

the plurality of catalyst particles for fluidizing at least a portion of the plurality of catalyst particles and creating a gaseous dispersion of catalyst particles that reacts with the gas for producing a product/decontaminated gas (fluidized bed, see abstract), the gas permeable separation device (44) being in communication between the port (46) and the second input (50, see Fig. 1), the port (46) configured to direct the decontaminated gas from the hollow interior region (24) through the gas permeable separation device (44) such that the plurality of catalyst nanoparticles collect on the gas permeable separation device (filter), the second input configured to direct a backpressure pulse/backflow of gaseous material through the gas permeable separation device (44) for displacing the plurality of catalyst particles previously collected on the gas permeable separation device therefrom (col. 1 lines 45-49), and allowing the plurality of catalyst nanoparticles displaced from the gas separation device to join the fluidized dispersion of catalyst particles (via conduit 26) and continue reacting with the gas within the hollow interior region; and

While Miller teaches a catalyst for reacting with a reactant stream, Miller fails to teach the plurality of catalysts as being nanoparticles.

Zhou also discloses a catalytic process.

Zhou teaches nanoparticles comprising a metal (col. 8 lines 33-43) being utilized as the catalyst in an oxidation reaction in order to ensure high activity and selectivity of desired products (col. 5 lines 34-43). In other words, using catalyst nanoparticles to improve reaction activity was well known in the art at the time of the invention.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the nanoparticles of Zhou in the fluidized bed reactor of Becker in order to ensure high activity and selectivity of the desired reaction products.

Modified Miller teaches nano-sized oxidation catalyst in the range of 0.5 to 100nm (see Zhou, claim 15), but is silent on particle sizes in the range of 15-25nm.

However, regarding the size of the particles, it was well known in the art at the time of the invention that the particle size of the catalyst in a fluidized bed is a variable that is routinely varied to achieve the desired performance (see Kinkade, col. 7 lines 51-59). As such the size of the catalyst particles is not considered to confer patentability to the claim. The size of the particles would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed size of the catalyst particles cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the size of the catalyst particles in modified Miller to obtain the desired fluidized bed performance (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

Modified Miller, as discussed above, discloses a vessel with multiple inlets (process inlet and fluidizing inlet, along with a backpressure backflow inlet). Modified Miller, however, does not disclose a specific control strategy utilized by

a control device that synchronizes the backpressure pulse valve with the first input valve.

Ballantine discloses a series of controlled valves introducing multiple fluid inlets to the same process space.

Ballantine teaches a valve synchronization process of closing an inlet valve (402) connected to a vessel (412) when a second inlet valve (401) is opened in order to prevent backflow through the first process valve (paragraph 42)

It would have been obvious to one of ordinary skill in the art at the time of the invention to change the control scheme of the valve controller in modified Miller to synchronize the valve opening of the second inlet with the valve opening of the first inlet such that when the second inlet valve opens, the first inlet valve closes in order to prevent back flow through the first inlet valve, as is taught by Ballantine.

Regarding claim 27, Miller further discloses solenoid valves (col. 4 lines 4-9).

Regarding claim 30, Miller further discloses the second input has a product/decontaminated gas passage way, the product/decontaminated gas passage way (46) configured to receive the product/decontaminated gas exiting from the hollow interior region through the port (56) and the gas permeable separation device (44), the decontaminated gas passage way further configured to recycle the decontaminated gas through at least one of the fluidizing inlet and the port into the hollow interior region (see Fig. 1).

Regarding limitations recited in claims 25 and 30 which are directed to a manner of operating disclosed system, neither the manner of operating a

disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114 and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim.

Regarding claims 32 and 33, modified Miller, as discussed in claim 30 above, teaches a filtration device (also called the gas permeable separation membrane).

Modified Miller, however, does not discloses a second filtration device downstream of the first filtration device (gas permeable membrane) that is configured to generate a signal and relay it to the control device, however, providing a duplicate filtration device would amount to a mere duplication of parts. It has been held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

Regarding claim 34, modified Miller further discloses a gas source coupled to the second input (blowback gas, see Fig. 1) for providing the backpressure pulse, and a gas source (fluidizing gas) coupled to the entrance of the fluidizing material into the hollow interior region (see inlet 12 of Miller).

6. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miller (US 3,615,256), Zhou (US 6,500,969) and Ballantine et al. (US 2006/0078771) as applied to claim 25 above, and further evidenced by Breton et al. (US 3,997,447).

Regarding claim 26, modified Miller fails to teach the at least one control device is further configured to introduce the backpressure pulse of gaseous material through the gas permeable separation device for about 0.2 seconds and introduce at least one of the contaminated gas and the fluidizing material into the hollow interior region for about 0.8 seconds.

However, it was well known in the art at the time of the invention that the length and frequency of the backpressure pulses, has a significant effect on the performance and operation of a filter that utilizes this method of cleaning (see Breton col. 4 line 67 - col. 5 line 4 and col. 5 lines 36-49, where Breton discloses the preference for frequent backpulses in order to prevent buildup of catalyst on the boundary of a filter). As such, the timing of the backpulses is not considered to confer patentability to the claim, as the length and frequency of the backpulses is a variable that can be modified, as is taught by Breton, is considered a result effective variable. As such, without showing unexpected results, the claimed length of the backpressure pulses cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the length of the backpressure pulses modified Miller to obtain the desired mixing and flow distribution (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the

optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

7. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miller (US 3,615,256), Zhou (US 6,500,969) and Ballantine et al. (US 2006/0078771) as applied to claim 30 above, and further in view of Choudhary et al. (US 5,936,135).

Regarding claim 31, modified Miller, as discussed in claim 30 above, fails to teach a flame ionization detector in communication between the decontaminated gas passage way and the fluidizing input, such that the decontaminated gas passes through the flame ionization detector to the fluidizing input.

Choudhary discloses a reactor for processing a combustible gas (such as propane, which is also taught by Becker, see paragraph 28 of Becker). Choudhary teaches a flame ionization detector at the outlet of the reactor in order to assess the quality and performance of the product gas and the reactor (col. 12 lines 26-34).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to add the gas chromatograph utilizing a flame ionization detector, as taught by Choudhary, in the product line of Miller in order to assess the quality and performance of the product gas and the reactor.

8. Claims 1-3, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368) in view of Zhou (US 6,500,969) and Li et al. (US 6,782,892) and further evidenced by Kinkade (US 4,994,498).

Regarding claims 1, 9 and 10, Becker discloses:

A fluidized-bed oxidation reactor comprising:

a chamber (Fig. 1 (1)) defining a hollow interior region and having a lower surface (4);

a first input (6) for introducing a gas into the hollow interior region;

a plurality of particles (2) within the hollow interior region and located on the lower surface (4), and;

a fluidizing input (10) for introducing a fluidizing material into the hollow interior region (gas, paragraph 32 lines 4-5), said fluidizing input having an outlet directed at the lower surface of the chamber (see Fig. 1 (10), paragraph 26 lines 3-5). The entry of gas into a bed of catalyst will fluidize at least a portion of an already fluidized bed.

Furthermore, regarding limitations which are directed to a manner of operating disclosed system, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114 and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an

intended operation are of no significance in determining patentability of the apparatus claim.

While Becker teaches the catalyst containing metal (paragraph [0032]) such as gold, Becker fails to teach the plurality of catalysts as being nanoparticles.

Zhou also discloses an oxidation process (as does Becker) and the type of catalyst used in said oxidation process.

Zhou teaches nanoparticles comprising a metal (col. 8 lines 33-43) being utilized as the catalyst in an oxidation reaction in order to ensure high activity and selectivity of desired oxidation products (col. 5 lines 34-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the nanoparticles of Zhou in the fluidized bed oxidation reactor of Becker in order to ensure high activity and selectivity of the desired oxidation products.

Modified Becker teaches nano-sized oxidation catalyst in the range of 0.5 to 100nm (see Zhou, claim 15), but is silent on particle sizes in the range of 15-25nm.

Li also discloses a nanosized oxidation catalyst.

Li teaches a nanocatalyst used for oxidation with a particle size of 25nm as a preferable way of oxidizing a reactant (col. 8 lines 55-61).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particle diameter of 25nm, as in Li, in the catalyst of modified Becker as a known size of nanoparticle to oxidize a reactant.

Furthermore, regarding the size of the particles, it was well known in the art at the time of the invention that the particle size of the catalyst in a fluidized bed is

a variable that is routinely varied to achieve the desired performance (see Kinkade, col. 7 lines 51-59). As such the size of the catalyst particles is not considered to confer patentability to the claim. The size of the particles would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed size of the catalyst particles cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the size of the catalyst particles in modified Becker to obtain the desired fluidized bed performance (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

Regarding claim 2, Becker, further discloses that the nanoparticles will be fluidized by the inlet of gas from the first inlet (paragraph 32 lines 4-8).

Regarding claim 3, Becker further discloses a fluidized-bed chamber comprising a port (Fig. 1, (8)) for the exit of the decontaminated gas out of the hollow interior region (paragraph 35 line 9).

9. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claim 3 above, and further in view of Alford et al. (US 6,887,291).

Regarding claim 4, the modified Becker discloses a fluidized catalyst (2) in a reaction bed with an exit port (8) for the gas that has reacted, but does not teach the claimed nanoparticle separation from the effluent gas method and apparatus comprising:

a second input for introducing a backpressure pulse of gaseous material into the hollow interior region through the port, or

a gas permeable separation device in communication with said port and the exit of gas from the hollow interior region through the gas permeable separation device for separating catalyst nanoparticles and causing them to collect upon the gas permeable separation device and where the entrance of the backpressure pulse displaces the collected catalyst nanoparticles.

Alford discloses a filter device for removing nanomaterials from gas streams using a gas permeable separating device (Fig.1 (2), see Abstract).

Alford teaches a second input (5) for introducing a backpressure pulse (pulse jet) of gaseous material into a hollow interior region (10) (col. 7 lines 59-67) in order to clean a filter (col. 7 lines 43-55). Alford also teaches a gas permeable separation device (filter, 2) in communication with a hollow interior region (10) and the second input (5) and the entrance for introducing a backpressure pulse (pulse jet) into the hollow interior region (10) displacing collected catalyst nanoparticles (col. 7 lines 43-55). Alford teaches this in order to allow catalyst nanoparticles to be collected by said gas permeable separation device (filter) and to clean said gas permeable separation device of said catalyst nanoparticles (col. 7 lines 35-67).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the backpressure pulse input of Alford with the fluidized bed oxidation reactor with nanoparticles of the modified Becker in order to clean the filter that is used to separate the nanoparticles from the gas stream with the second input. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the gas permeable separation device (in communication with the second input) and the entrance of the backpressure pulse into the hollow interior region to displace the collected nanoparticles of Alford, with the fluidized bed oxidation reactor of the modified Becker in order to allow catalyst nanoparticles to be collected by said gas permeable separation device and to clean said gas permeable separation device of said catalyst nanoparticles.

10. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892), and Alford et al. (US 6,887,291) as applied to claim 4 above, and further in view of Ballantine et al. (US 2006/0078771).

Regarding claims 7, modified Becker, as discussed in claim 4 above, discloses a vessel with two 'competing inlets' (process inlet and fluidizing inlet, competing with backpressure pulse inlets). By the term 'competing inlets', the examiner is referring to two independent inlets that are injecting fluid into the same space. Modified Becker, however, does not disclose a specific control strategy utilized

by a control device that synchronizes the backpressure pulse valve with the first input valve.

Ballantine discloses a series of controlled valves introducing multiple fluid inlets to the same process space.

Ballantine teaches a valve synchronization process of closing an inlet valve (402) connected to a vessel (412) when a second inlet valve (401) is opened in order to prevent backflow through the first process valve (paragraph 42)

It would have been obvious to one of ordinary skill in the art at the time of the invention to change the control scheme of the valve controller in modified Becker to synchronize the valve opening of the second inlet with the valve opening of the first inlet such that when the second inlet valve opens, the first inlet valve closes in order to prevent back flow through the first inlet valve, as is taught by Ballantine.

11. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claim 1 above, and further in view of Goswami (US 5,933,702).

Regarding claim 6, the modified Becker discloses all of the claims limitations, as discussed with respect to claim 1 above, but does not teach a humidifier in communication with the first input (gas inlet).

Goswami also discloses a photocatalytic/oxidation reactor for reacting a gas to remove contaminants via oxidation.

Goswami discloses a humidifier (Fig. 1 (50)) on the gas inlet (18) to a photocatalytic/oxidation reactor (21) in order to provide the correct relative humidity for the complete oxidation and destruction of a microorganism in the photocatalytic/oxidation reactor (col. 7 line 60 – col. 8 line 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the humidifier and photocatalytic/oxidation reactor of Goswami with the fluidized bed oxidation reactor of Becker in order to ensure the correct humidity for the complete oxidation and destruction of said microorganisms.

12. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claim 1 above, and further in view of Wu (US 2002/0187082).

Regarding claims 11 and 12, the modified Becker discloses all of the claim's limitations as discussed in claim 1 above, but fails to teach an ultraviolet light as well as the ultraviolet light within the hollow interior region of the chamber.

Wu teaches a photocatalytic/oxidation reactor (Fig. 3(a) (315)) which uses photocatalysts to treat polluted air.

Wu also teaches an ultraviolet light (320) in order to facilitate chemical reactions in photocatalysis (paragraph 8, lines 1-4). Wu further teaches said ultraviolet light being positioned within the hollow interior of the chamber (315). It is well known in the art that positioning the ultraviolet light inside the reactor or

chamber maximize the exposure of the photocatalyst or the photoactive material, as is shown by Sanderson (US 2005/0079124, paragraph 113).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the internally positioned ultraviolet light of Wu with fluidized bed oxidation reactor of the modified Becker in order to facilitate chemical reactions in photocatalysis and maximize the exposure of the photocatalyst.

13. Claims 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claim 1 above, and further in view of Sato (US 6,812,470).

Regarding claims 11 and 13, the modified Becker discloses all of the claims limitations, as discussed in claim 1 above, but fails to teach the ultraviolet light positioned outside of the chamber/reactor.

Sato also discloses a photocatalytic/oxidation reactor chamber (Fig. 2 (50)).

Sato teaches an ultraviolet light (80) positioned outside of the reactor chamber in order to facilitate preventing the ultraviolet light from overheating by using a fan blowing external air (col. 5 lines 18-24).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the external ultraviolet light of Sato with the photocatalytic/oxidation reactor of the modified Becker in order to facilitate prevention of the ultraviolet light overheating by using a fan blowing external air.

14. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892) and Wu (US 2002/0187082) as applied to claim 11 above, and further in view of Goswami (US 5,933,702).

Regarding claim 14, the modified Becker discloses all of the claims limitations, as discussed in claim 11 above, but does not teach a humidifier in communication with the first input (gas inlet).

Goswami teaches a photocatalytic/oxidation reactor for reacting a gas to remove contaminants.

Goswami also teaches a humidifier (Fig. 1 (50)) on the gas inlet (18) to a photocatalytic/oxidation reactor (21) in order to provide the correct relative humidity for the complete oxidation and destruction of a microorganism in the photocatalytic reactor (col. 7 line 60 – col. 8 line 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the humidifier and photocatalytic/oxidation reactor of Goswami with the fluidized bed photocatalytic/oxidation reactor of the modified Becker in order to ensure the correct humidity for the complete oxidation and destruction of said microorganisms.

15. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892) and Wu (US 2002/0187082) as applied to claim 11 above, and further in view of Sherman (US 6,653,356).

Regarding claim 15, the modified Becker teaches all of the claim's limitations as discussed in claim 11 above, but does not disclose groups included in the photocatalytic material.

Sherman teaches the production of photocatalytic nanoparticles and describes uses therein, such as its anti-microbial (catalytic oxidation) properties.

Sherman also teaches that a type of photocatalytic material to be used on nanoparticles is titanium dioxide in order to save costs and leverage anti-microbial effects in the presence of ultraviolet light (Abstract and paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the titanium dioxide nanoparticles of Sherman with the oxidation/photocatalytic reactor and the nanoparticles of the modified Becker in order to save costs and leverage antimicrobial effects in the presence of ultraviolet light.

16. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892) and Wu (US 2002/0187082) as applied to claim 11 above, and further in view of Wei et al. (US 2005/0129591).

Regarding claims 16 and 17, the modified Becker discloses all of the claims limitations as discussed in claim 11 above, but does not teach a nanoparticle comprising a metal oxide and a co-catalyst.

Wei discloses a photocatalyst for air quality treatment (see title).

Wei teaches a nanoparticle photocatalyst that contains a metal oxide (titanium oxide) in order to destroy contaminants in an air purifier (paragraph 3 lines 1-2). Wei also teaches a co-catalyst (gold) in order to act together with the titanium dioxide as an effective thermocatalyst for room temperature oxidation of carbon monoxide to carbon dioxide (paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the metal oxide photocatalyst and gold co-catalyst of Wei with the fluidized photocatalytic/oxidation reactor of Becker in order to destroy air contaminants and oxidize carbon monoxide to carbon dioxide at room temperature.

17. Claims 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969) and Li et al. (US 6,782,892) as applied to claim 1 above, and further in view of Sigai (US 4,585,673).

Regarding claims 18-20, the modified Becker discloses all of the claims limitations as discussed in claim 1 above, but does not teach a means for agitating the catalyst nanoparticles in the hollow interior region.

Sigai also discloses a fluidized bed chamber (Fig. 1 (15)).

Sigai teaches an agitation/vibrating/shaking system (Fig. 1 (17,19)) in order to fluidize a suspended solid (in this case, phosphor powder) and improve the expansion of the fluidized bed (col. 4 lines 46-50).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the agitation/shaking/vibrating means of Sigai with the fluidized

bed oxidation reactor of Becker in order to fluidize the suspended solid and improve the expansion of the fluidized bed.

18. Claims 25, 27-30 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368) in view of Zhou (US 6,500,969), Li et al. (US 6,782,892), Alford et al. (US 6,887,291), Ballantine et al. (US 2006/0078771) and Miller (US 3,615,256) and further evidenced by Kinkade (US 4,994,498).

Regarding claims 25, 27, 28, Becker discloses:

a fluidized-bed oxidation reactor comprising:

a chamber (Fig. 1 (1)) defining a hollow interior region and having a lower surface (4);

a first input (6) for introducing a gas into the hollow interior region;

a plurality of particles (2) within the hollow interior region and located on the lower surface (4), and;

a fluidizing input (10) for introducing a fluidizing material into the hollow interior region (gas, paragraph 32 lines 4-5), said fluidizing input having an outlet directed at the lower surface of the chamber (see Fig. 1 (10), paragraph 26 lines 3-5). The entry of gas into a bed of catalyst will fluidize at least a portion of an already fluidized bed.

Furthermore, regarding limitations which are directed to a manner of operating disclosed system, neither the manner of operating a disclosed device nor material or article worked upon further limit an apparatus claim. Said limitations do not differentiate apparatus claims from prior art. See MPEP §2114

and 2115. Further, process limitations do not have a patentable weight in an apparatus claim. See *Ex parte Thibault*, 164 USPQ 666, 667 (Bd. App. 1969) that states "Expressions relating the apparatus to contents thereof and to an intended operation are of no significance in determining patentability of the apparatus claim.

While Becker teaches the catalyst containing metal (paragraph [0032]) such as gold, Becker fails to teach the plurality of catalysts as being nanoparticles.

Zhou also discloses an oxidation process (as does Becker) and the type of catalyst used in said oxidation process.

Zhou teaches nanoparticles comprising a metal (col. 8 lines 33-43) being utilized as the catalyst in an oxidation reaction in order to ensure high activity and selectivity of desired oxidation products (col. 5 lines 34-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the nanoparticles of Zhou in the fluidized bed oxidation reactor of Becker in order to ensure high activity and selectivity of the desired oxidation products.

Modified Becker teaches nano-sized oxidation catalyst in the range of 0.5 to 100nm (see Zhou, claim 15), but is silent on particle sizes in the range of 15-25nm.

Li also discloses a nanosized oxidation catalyst.

Li teaches a nanocatalyst used for oxidation with a particle size of 25nm as a preferable way of oxidizing a reactant (col. 8 lines 55-61).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a particle diameter of 25nm, as in Li, in the catalyst of modified Becker as a known size of nanoparticle to oxidize a reactant.

Furthermore, regarding the size of the particles, it was well known in the art at the time of the invention that the particle size of the catalyst in a fluidized bed is a variable that is routinely varied to achieve the desired performance (see Kinkade, col. 7 lines 51-59). As such the size of the catalyst particles is not considered to confer patentability to the claim. The size of the particles would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed size of the catalyst particles cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the size of the catalyst particles in modified Becker to obtain the desired fluidized bed performance (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

Also, the modified Becker discloses a fluidized catalyst (2) in a reaction bed with an exit port (8) for the gas that has reacted, but does not teach the claimed nanoparticle separation from the effluent gas method and apparatus comprising:

a second input for introducing a backpressure pulse of gaseous material into the hollow interior region through the port, or

a gas permeable separation device in communication with said port and the exit of gas from the hollow interior region through the gas permeable separation device for separating catalyst nanoparticles and causing them to collect upon the gas permeable separation device and where the entrance of the backpressure pulse displaces the collected catalyst nanoparticles.

Alford discloses a filter device for removing nanomaterials from gas streams using a gas permeable separating device (Fig.1 (2), see Abstract).

Alford teaches a second input (5) for introducing a backpressure pulse (pulse jet, which is triggered by an increase in pressure drop across the reactor, col. 8 lines 63-67) of gaseous material into a hollow interior region (10) (col. 7 lines 59-67) in order to clean a filter (col. 7 lines 43-55). Alford also teaches a gas permeable separation device (filter, 2) in communication with a hollow interior region (10) and the second input (5) and the entrance for introducing a backpressure pulse (pulse jet) into the hollow interior region (10) displacing collected catalyst nanoparticles (col. 7 lines 43-55). Alford teaches this in order to allow catalyst nanoparticles to be collected by said gas permeable separation device (filter) and to clean said gas permeable separation device of said catalyst nanoparticles (col. 7 lines 35-67).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the backpressure pulse input of Alford with the fluidized bed oxidation reactor with nanoparticles of the modified Becker in order to clean the

filter that is used to separate the nanoparticles from the gas stream with the second input. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the gas permeable separation device (in communication with the second input) and the entrance of the backpressure pulse into the hollow interior region to displace the collected nanoparticles of Alford, with the fluidized bed oxidation reactor of the modified Becker in order to allow catalyst nanoparticles to be collected by said gas permeable separation device and to clean said gas permeable separation device of said catalyst nanoparticles.

Also, modified Becker, as discussed above, discloses a vessel with a plurality of inlets. Modified Becker, however, does not disclose a specific control strategy utilized by a control device that synchronizes the backpressure pulse valve with the first input valve.

Ballantine discloses a series of controlled valves introducing multiple fluid inlets to the same process space.

Ballantine teaches a valve synchronization process of closing an inlet valve (402) connected to a vessel (412) when a second inlet valve (401) is opened in order to prevent backflow through the first process valve (paragraph 42).

It would have been obvious to one of ordinary skill in the art at the time of the invention to change the control scheme of the valve controller in modified Becker to synchronize the valve opening of the second inlet with the valve opening of the first inlet such that when the second inlet valve opens, the first

inlet valve closes in order to prevent back flow through the first inlet valve, as is taught by Ballantine.

Furthermore, modified Becker does not teach the plurality of catalyst nanoparticles displaced from the gas separation device to join the fluidized dispersion of catalyst nanoparticles and continue reacting with the contaminated gas within the hollow interior region.

Miller also discloses a fluidized catalyst bed with a filter associated with the outlet (see Fig. 1 and abstract).

Miller teaches a filter membrane (44) that traps catalyst particles thereon during operation and then provides a backpulse through the filters to clean the trapped catalyst particles (col. 1 lines 45-49). Miller further teaches a recycling configuration in which the removed catalyst particles are removed from the filter (44) and reintroduced into the fluidized bed (via conduit 26).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the catalyst recirculation configuration of Miller to the modified Becker, in order to reutilize the catalyst that was trapped on the gas separation membrane. Furthermore, adding the catalyst recirculation configuration of Miller to the fluidized bed of modified Becker would amount to nothing more than a combination of prior art elements according to known methods to yield predictable results.

Regarding claim 29, modified Becker, as discussed in claim 25 above, discloses a gas permeable layer (4) within the hollow interior region of the chamber (see Fig. 1), the gas permeable layer having the plurality of catalyst

nanoparticles thereon in a non-fluidized state (paragraph 32), but does not disclose the fluidizing input (10) at a 45 degree angle relative to the gas permeable layer (see Fig. 1).

However such modification is a mere rearrangement of the system parts that would not modify the operation of the system, and would have been obvious to one of ordinary skill in the art at the time of the invention. See In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950).

Regarding claim 30, modified Becker, as discussed in claim 25 above, further discloses product gas, exiting from the hollow interior region through the port, through the gas permeable separation device (as modified by Alford), and recycled back to the fluidizing inlet (see paragraph 32).

Regarding claims 32 and 33, modified Becker, as discussed in claim 30 above, teaches a filtration device (also called the gas permeable separation membrane) that is configured to detect a drop in pressure across the filter in order to assess the amount of catalyst particles that have collected on the boundary layer (see Alford, col. 8 lines 63-67, where pressure is detected and relayed) and relaying this information to the control device.

Modified Becker, however, does not discloses a second filtration device downstream of the first filtration device (gas permeable membrane) that is configured to generate a signal and relay it to the control device, however, providing a duplicate filtration device would amount to a mere duplication of parts. It has been held that mere duplication of parts has no patentable

significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

Regarding claim 34, modified Becker further discloses a gas source coupled to the second input (see Alford, 20) for providing the backpressure pulse, and a gas source (see 12 of Becker) coupled to the entrance of the fluidizing material into the hollow interior region (see inlet 10 of Becker).

19. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892), Alford et al. (US 6,887,291), Ballantine et al. (US 2006/0078771) and Miller (US 3,615,256) as applied to claim 25 above, and further evidenced by Breton et al. (US 3,997,447).

Regarding claim 26, modified Becker fails to teach the at least one control device is further configured to introduce the backpressure pulse of gaseous material through the gas permeable separation device for about 0.2 seconds and introduce at least one of the contaminated gas and the fluidizing material into the hollow interior region for about 0.8 seconds.

However, it was well known in the art at the time of the invention that the length and frequency of the backpressure pulses, has a significant effect on the performance and operation of a filter that utilizes this method of cleaning (see Breton col. 4 line 67 - col. 5 line 4 and col. 5 lines 36-49, where Breton discloses the preference for frequent backpulses in order to prevent buildup of catalyst on the boundary of a filter). As such, the timing of the backpulses is not considered to confer patentability to the claim, as the length and frequency of the backpulses

is a variable that can be modified, as is taught by Breton, is considered a result effective variable. As such, without showing unexpected results, the claimed length of the backpressure pulses cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the length of the backpressure pulses modified Becker to obtain the desired mixing and flow distribution (In re Boesch, 617 F. 2d. 272,205 USPQ 215 (CCPA 1980)). Since it has been held that where general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art (In re Aller, 105 USPQ 223).

20. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US 2002/0006368), Zhou (US 6,500,969), Li et al. (US 6,782,892), Alford et al. (US 6,887,291), Ballantine et al. (US 2006/0078771) and Miller (US 3,615,256) as applied to claim 30 above, and further in view of Choudhary et al. (US 5,936,135).

Regarding claim 31, modified Becker, as discussed in claim 30 above, fails to teach a flame ionization detector in communication between the decontaminated gas passage way and the fluidizing input, such that the decontaminated gas passes through the flame ionization detector to the fluidizing input.

Choudhary discloses a reactor for processing a combustible gas (such as propane, which is also taught by Becker, see paragraph 28 of Becker). Choudhary teaches a flame ionization detector at the outlet of the reactor in

order to assess the quality and performance of the product gas and the reactor (col. 12 lines 26-34).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to add the gas chromatograph utilizing a flame ionization detector, as taught by Choudhary, in the recycle line of Becker in order to assess the quality and performance of the product gas and the reactor.

Response to Arguments

21. Arguments regarding the rejections of claims 1-3, 9, 10 and 21 under 35 USC §103(a) in view of Becker, Zhou, and Li have been fully considered but are not persuasive.

On page 12, Applicant argues that "by replacing Becker's oxidizing agents with Zhou's catalyst nanoparticles that only make hydrogen peroxide, "modified Becker" appears to result in an inoperative embodiment and violates the basic principle set forth in Zhou". This argument is moot as it is directed towards modifications that were not presented by the examiner. The examiner did not modify Becker with the hydrogen peroxide producing catalyst of Zhou, but rather the feature of a "nano-catalyst" in order to facilitate a chemical reaction.

On pages 13 and 14, Applicant argues that the claimed size of the catalyst (15-25nm) is not a results effective variable and therefore would not have been optimized by one skilled in the art. The examiner respectfully disagrees with this argument and notes that the examiner did not state that the size of the catalyst particles of the present invention is a results effective variable, but rather that the size of the nano-

particles of Zhou are a results effective variable. The size of the nano-particles referenced in Zhou, range in size from 0.5nm to 100nm, which encompasses the claimed range. As such, Becker, as modified by Zhou, teaches a wider catalyst particle size range than the claimed 15-25nm. As shown by Kinkade, the size of a catalyst particle can be varied to adjust the performance of a catalyst. Therefore, the disclosed range of Zhou (0.5-100nm) would have been varied by one skilled in the art to achieve the desired results.

It is also noted that the examiner did not use Kinkade as a modifying reference, but rather a reference to indicate the well known practice of varying catalyst size.

22. Applicant's arguments regarding the rejection of claims 4, 5, 22 and 23 under 35 USC §103(a) have been fully considered but are moot in view of the new grounds of rejection necessitated by amendment.

23. Applicant's arguments regarding the rejection of claims 7 and 24 under 35 USC §103(a) have been fully considered but they are not persuasive.

On page 21, Applicant argues that Ballatine teaches a 4-valve system where each operational state allows gas direction and entry into the fuel at only one entry point, and therefore is inapplicable to the present invention because the present invention claims a backpressure pulse of gaseous material that passes into the hollow interior region of the reactor and allowing the plurality of catalyst nanoparticles displaced from the gas separation device to join the fluidized bed.

The examiner recognizes the difference between Ballatine and the claimed apparatus, however, the purpose of Ballatine is not to indicate a preferable flow path but rather to show the general state of the art with respect to valve control when two separate valves are each feeding material into a single vessel.

24. It is also noted that throughout this office action, a plurality of references are used to reject the instant claims. While the claimed invention may be novel, it is the examiners position that the differences between the prior art and the claimed invention are not nonobvious. Each of the elements claimed in Applicant's invention are well known methods and apparatuses to ones skilled in the art, and the combination of these elements leads to expected and entirely predictable results.

Conclusion

25. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory

action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. MERKLING whose telephone number is (571)272-9813. The examiner can normally be reached on M-F 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. J. M./
Examiner, Art Unit 1795

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795